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| 10/773,289 | 02/09/2004 | Chang-ho Cho | 249/445 | 8742 |
| 27849 | 7590 | 10/26/2006 | EXAMINER | |
| LEE & MORSE, P.C. 3141 FAIRVIEW PARK DRIVE SUITE 500 FALLS CHURCH, VA 22042 | | | CHOI, HAN S | |
| | | | ART UNIT | PAPER NUMBER |
| | | | 2853 | |

DATE MAILED: 10/26/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/773,289

Applicant(s)

CHO ET AL.

Examiner

Han S. Choi

Art Unit

2853

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 05 September 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) 13-18 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-12 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 09 February 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION***Double Patenting***

1. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

1. Claims 1-12 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1, 2, 4, 5, 6, 7, and 9 of U.S. Patent No.

6,886,919 in view of Silverbrook (US Pat. 5,841,452) and Chan (US Pat. 5,710,070).

Claims 1-12 in the pending application for an ink-jet printhead having a metallic heat dissipation layer are covered by claims 1, 2, 4, 5, 6, 7, and 9 of the prior art as shown in the table.

| <u>Patent Claims</u> | <u>Pending Claims</u> |
|--|---|
| 1. A monolithic ink-jet printhead, comprising: a substrate having an ink | 1. An ink-jet printhead, comprising: a substrate; an ink chamber to be filled |

Art Unit: 2853

chamber to be supplied with ink to be ejected, a manifold for supplying ink to the ink chamber, and an ink channel in communication with the ink chamber and the manifold; a nozzle plate including a plurality of passivation layers stacked on the substrate and a heat dissipating layer stacked on the plurality of passivation layers; a nozzle, including a lower part and an upper part, the nozzle penetrating the nozzle plate so that ink ejected from the ink chamber is ejected through the nozzle; a heater provided between adjacent passivation layers of the plurality of passivation layers of the nozzle plate, the heater being located above the ink chamber for heating ink within the ink chamber; and a conductor between adjacent passivation layers of the plurality of passivation layers of the nozzle plate, the conductor being electrically connected to the heater for applying current to the heater, wherein the heat dissipating layer is made of a thermally conductive metal for dissipating heat from the heater, the lower part of the nozzle is formed by penetrating the plurality of passivation layers, and the upper part of the nozzle is formed by

with ink to be ejected formed on an upper surface of the substrate; a restrictor, which is a path through which ink is supplied from an ink reservoir to the ink chamber, perforating a bottom surface of the substrate and a bottom surface of the ink chamber; a nozzle plate, which is stacked on the upper surface of the substrate and forms an upper wall of the ink chamber; a nozzle perforating the nozzle plate at a position corresponding to a center of the ink chamber; a heater formed in the nozzle plate to surround the nozzle; and a conductor for applying a current to the heater.

3. The ink-jet printhead as claimed in claim 1, wherein the heater surrounds the nozzle.

6. The ink-jet printhead as claimed in claim 1, wherein the nozzle plate includes a plurality of passivation layers.

9. The ink-jet printhead as claimed in claim 6, wherein the nozzle plate further includes a heat dissipating layer stacked on the plurality of passivation layers.

Art Unit: 2853

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| <p>penetrating the heat dissipating layer in a tapered shape in which a cross-sectional area thereof decreases gradually toward an exit thereof.</p> | <p>10. The ink-jet printhead as claimed in claim 9, wherein the heat dissipating layer defines an upper portion of the nozzle and is formed of a metallic material having thermal conductivity to dissipate heat generated by the heater and heat remaining around the heater.</p> |
| <p>2. The printhead as claimed in claim 1, wherein the plurality of passivation layers include first, second, and third passivation layers sequentially stacked on the substrate, the heater is formed between the first and second passivation layers, and the conductor is formed between the second and third passivation layers.</p> | <p>7. The ink-jet printhead as claimed in claim 6, wherein the plurality of passivation layers includes a first passivation layer, a second passivation layer, and a third passivation layer, which are sequentially stacked on the substrate, and wherein the heater is disposed between the first passivation layer and the second passivation layer, and the conductor is disposed between the second passivation layer and the third passivation layer.</p> |
| <p>4. The printhead as claimed in claim 1, wherein the heat dissipating layer is formed by electroplating to a thickness of about 10-50 .mu.m, and the upper part of the nozzle has a length of about 10-50 .mu.m.</p> | <p>12. The ink-jet printhead as claimed in claim 9, wherein the heat dissipating layer has a thickness greater than about 10 .mu.m.</p> |
| <p>5. The printhead as claimed in claim 1, wherein the heat</p> | <p>11. The ink-jet printhead as claimed in claim 10, wherein</p> |

Art Unit: 2853

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| <p>dissipating layer is made of a transition element metal.</p> <p>6. The printhead as claimed in claim 5, wherein the transition element is nickel or gold.</p> | <p>the heat dissipating layer is formed of at least one material selected from the group consisting of Ni, Fe, Au, Pd, and Cu.</p> |
| <p>8. The printhead as claimed in claim 7, wherein the heat conductive layer is made of a metal.</p> <p>9. The printhead as claimed in claim 7, wherein the conductor and the heat conductive layer are made of the same metal and located on the same passivation layer.</p> | <p>5. The ink-jet printhead as claimed in claim 1, wherein the conductor is formed of aluminum or an aluminum alloy.</p> |

Claims 1, 2, 4, 5, 6, 7, and 9 of US Pat. 6,886,919 contain the basic elements of the claimed limitations of the pending application except for the restrictor having a length of about 200-750 μm of claim 2 of the pending application, the heater formed of one material selected from the group consisting of TaAl, TiN, CrN, W, and polysilicon of claim 4 of the pending application, the plurality of passivation layers is formed of at least one material selected from the group consisting of SiO_2 , Si_3N_4 , SiC, Ta, Pd, Au, TaO, TaN, Ti, TiN, Al_2O_3 , CrN, and RuO_2 of claim 8 of the pending application, and the

Art Unit: 2853

metallic conductor claimed by U.S. Patent No. 6,886,919 formed of aluminum or aluminum alloy of claim 5 of the pending application.

Referring to claim 2 of the pending application, Silverbrook teaches the restrictor [114] having a length of about 200-750 microns in [Col. 6, Lines 11-14] shown in Fig. 7 (the restrictor [114] is 300 microns deep which falls in the stated range of 200-750 microns).

Referring to claim 5 of the pending application, Silverbrook teaches the conductor [123] formed of aluminum or an aluminum alloy in [Col. 7, Lines 24-27].

Referring to claim 8, of the pending application, Silverbrook teaches each of the plurality of passivation layers [144, 142, 136, and 132] are formed of at least one material selected from the group consisting of SiO_2 , Si_3N_4 , SiC , Ta, Pd, Au, TaO, TaN, Ti, TiN, Al_2O_3 , CrN, and RuO_2 in [Col. 7, Lines 6-11 and Lines 38-41] and [Col. 6, Lines 25-26] and [Col. 8, Lines 33-34].

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to incorporate the teachings of Silverbrook with the ink-jet printhead and metallic conductor of U.S. Patent No. 6,886,919 for the purpose of creating printheads to specific drop sizes, to provide appropriate electrical and thermal properties to the conductor to connect the drive electronics to the heater, and to provide electrical insulation and mechanical cushioning to the heater from the force of a collapsing bubble.

Referring to claim 4 of the pending application, Chan teaches a heater formed out of titanium nitride or TiN in [Col. 2, Lines 10-14].

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to incorporate the teaching of Chan into the ink-jet printhead of U.S. Patent No. 6,886,919 for the purpose of making the resistor more reliable, especially at higher temperatures and less complicated to manufacture.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1, 2, 3, 5, 6, and 8 are rejected under 35 U.S.C. 102(b) as being anticipated by Silverbrook (US Pat. 5,841,452).

Referring to claim 1:

- an ink-jet printhead in [Col. 2, Lines 16-17]
- a substrate in [Col. 1, Lines 64-67]
- an ink chamber [112] to be filled with ink to be ejected formed on an upper surface of the substrate in [Col. 6, Lines 38-41]
- a restrictor [114], which is a path through which ink is supplied from an ink reservoir (beneath [114], any printhead has a reservoir to supply ink to the nozzle) to the ink chamber [112 and 113], perforating a bottom surface of the substrate [100] and a bottom surface of the ink chamber [112 and 113] shown in Figs. 6-9 and below.

Art Unit: 2853

- a nozzle plate [142], which is stacked on the upper surface of the substrate and forms an upper wall of the ink chamber in [Col. 8, Lines 21-26] shown in Fig. 11.
- a nozzle perforating the nozzle plate [142] at a position corresponding to a center of the ink chamber [111] shown in Fig. 11.
- a heater [120] formed in the nozzle plate [142] to surround the nozzle shown in Fig. 11.
- a conductor [123] for applying a current to the heater [120] in [Col. 7, Lines 24-27]

Referring to claim 2:

- the restrictor [114] has a length of about 200-750 microns in [Col. 6, Lines 11-14] shown in Fig. 7 (the restrictor [114] is 300 microns deep which falls in the stated range of 200-750 microns).

Referring to claim3:

- the heater [120] surrounds the nozzle [111] in [Col. 6, Lines 51-54] shown in Fig. 10.

Referring to claim 5:

- the conductor [123] is formed of aluminum or an aluminum alloy in [Col. 7, Lines 24-27]

Referring to claim 6:

- the nozzle plate includes a plurality of passivation layers [144, 142, 136, and 132] shown in [Col. 7, Lines 6-11 and Lines 38-41] and [Col. 6, Lines 25-26] shown in Fig. 12. (passivation is defined as coating with an oxide layer).

Art Unit: 2853

Referring to claim 8:

- each of the plurality of passivation layers [144, 142, 136, and 132] are formed of at least one material selected from the group consisting of SiO₂, Si₃N₄, SiC, Ta, Pd, Au, TaO, TaN, Ti, TiN, Al₂O₃, CrN, and RuO₂ in [Col. 7, Lines 6-11 and Lines 38-41] and [Col. 6, Lines 25-26] and [Col. 8, Lines 33-34].

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Silverbrook (US Pat. 5,841,452) in view of Chan (US Pat. 5,710,070).

Silverbrook discloses the basic elements of the claimed invention except for the heater being formed of one material selected from the group consisting of TaAl, TiN, CrN, W, and polysilicon.

Chan teaches a heater formed out of titanium nitride or TiN in [Col. 2, Lines 10-14].

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to incorporate the teaching of Chan with the printhead of Silverbrook for the purpose of making the resistor more reliable, especially at higher temperatures and less complicated to manufacture.

6. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Silverbrook (US Pat. 5,841,452) in view of Lee et al. (US 2002/0008738).

Silverbrook discloses the basic elements of the claimed invention except for the plurality of passivation layers including a first passivation layer, a second passivation layer, and a third passivation layer, which are sequentially stacked on the substrate, and wherein the heater is disposed between the first passivation layer and the second passivation layer, and the conductor is disposed between the second passivation layer and the third passivation layer.

Lee et al. teaches a plurality of passivation layers including a first passivation layer [110], a second passivation layer [150], and a third passivation layer [130], which are sequentially stacked on the substrate [100], and wherein the heater [120] is disposed between the first passivation layer [110] and the second passivation layer [150], and the conductor [140] is disposed between the second passivation layer [150] and the third passivation layer [130] shown in [Paragraph 0052-0059] shown in Fig. 18.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to incorporate the teachings of Lee et al. with the printhead of Silverbrook for the purpose of simplifying the fabricating process compared with conventional manufacturing methods in [Paragraph 0075].

Response to Arguments

7. Applicant's arguments filed 9/5/06 have been fully considered but they are not persuasive.

Applicant's argument regarding the obviousness-type double patenting of claims 1-12 is noted. The applicant asserts that the obviousness-type double patenting rejection does not show differences between the inventions defined by the conflicting claims compared, a claim in the patent compared to a claim in the application, and a reason why a person of ordinary skill in the art would conclude that the invention defined in the claim in issue is an obvious variation of the invention defined in a claim in the patent. Contrary to the applicant's assertions, the rejection clearly illustrates the differences between the claimed invention and the conflicting patent and clearly states a reason why a person of ordinary skill in the art would conclude that the invention of the pending application is an obvious variation of the invention defined in a claim of the patent.

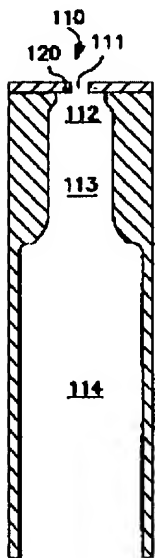
In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Applicant's argument regarding the 35 U.S.C. 102 rejection of claims 1, 2, 3, 4, 6, and 8 is noted. From the rejection above, [112 and 113] are directed to the ink chamber only while the reservoir is not shown in the corresponding figure. Ink is supplied from

Art Unit: 2853

the reservoir (beneath [114], any printhead has a reservoir to supply ink to the nozzle) through the restrictor [114] to the ink chamber [112 and 113] see figure below.

Applicant's argument regarding the 35 U.S.C. 103 rejections made to claims 4 and 7 are noted. The Chan and Lee et al. references teach the missing elements of the claimed invention with respect to their base reference.

**FIG. 9**Reservoir

Conclusion

8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the


shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Han S. Choi whose telephone number is (571) 272-8350. The examiner can normally be reached on Monday - Friday, 8:30am to 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Meier can be reached on (571) 272-2149. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

HSC
10/16/06


STEPHEN MEIER
SUPERVISORY PATENT EXAMINER